# Mixed Oxidant Treatment in a DOE Wastewater Facility

Charlie Barnett, Supervisor

ΤO

SWSC Wastewater Treatment Plant

Rodney Herrington, P.E.

Director of MIOX Corporation R&D

johnson controls



Page 1 \7/15/97

## Who is Johnson Controls?

- JCI is subcontractor that provides operations and maintenance for Los Alamos National Laboratory (LANL)
- LANL is operated by the University of California for DOE

johnson controls **MOX** 

Page 217/15/97

TO

	_	
1	☐ Mixed Oxidant Treatn	ient
	in a DOE Wastewater Facility	
	Charlie Barnett, Supervisor	3
	SWSC Wastewater Treatmen	nt Plant
	Rodney Herrington, P.E.	
	Director of MIOX Corporation	on R&D
2	Who is Johnson Control	ols?
	<ul> <li>JCI is subcontractor that maintenance for Los Alai</li> </ul>	provides operations and mos National Laboratory (LANL)
	■ LANL is operated by the l	Iniversity of California for DOE
3	□ Who is MIOX Corpora	ition?
	■ MIOX technology	
	» devel, in Los Alamos, SBIR co	ontract 1985 - 1991
	» patented	1988 - Present
	MIOX field testing	1986 - 1993
	■ MIOX Corp. spun out of L	ATA 1994
	■ 300 mixed oxidant gener	ators built, sold, and operating:
	» across the US, Asia, the Sout America	h Pacific, Canada, Europe, South and Centro
4	☐ What is TA-46?	
5	□ What is TA-46?	
	x 43 square mile area, ≥ 1200 build	a week 54 miles of gravity and pressure sewer lines lings (>7.5 million sq. ff.)
	Only one violation since open over 1500 process control tests /	erations began in August 1992 month to meet NPDES permit requirements
6	🗀 Designed for	
	Unique Operations of	LANL
	■ Located in Canada del Buey at T/	4-46
	Operations include extended aero	ation, and nitrification-denitrification
	•	ank systems were eliminated by SWSC plant
	90% of water received between 9	•

- Designed for 600,000 gpd; receives 350,000 gpd M-F & 100,000 gpd on S&S
- Q-clearance requirements & heavy training requirements

## 7 Treatment Process Before MIOX

- Plant components included:
  - » entrance works with Parshall flume, bar screen and grit chamber
  - » dual equalization and aeration basins
  - n dual clarifiers
  - » chlorination facilities (eliminated w/MIOX)

- » treated effluent return system
- n sludge drying beds

## 8 Treatment Process Before MIOX

### 9 Previous Disinfection

- Two 1-ton cylinders on-line
- 20 lbs. of gas used per day
- m Needed capacity for chlorine at head of the plant or for filamentary organisms
- Was meeting all regulations and safety requirements
- Lights, alarms, special locks, eyewash stations, wind sock, etc. in place
- No violations and no findings

## 10 Why MIOX?

#### Current System Requirements & Concerns

- DOE risk assessment showed chlorine gas is the biggest non-rad safety concern in DOE
- Chlorine hazards
  - » potential releases
  - » error potential with ton cylinder valves
  - » violent reaction of Ci<sub>2</sub> with ammonia, petroleum products, other chemicals
- Several crafts involved in maintenance
- m Liquid Cl<sub>2</sub> in gas feed fines
- False alarms
- Faulty manual valves, solenoid valves
- Piping config. allowed back-feed
- Feed control regulation problems

#### 

#### New System Requirements & Concerns

- **■** Disinfection residual
- Regulations future restrictions on gas, or costly system required for compliance
- Operations, maintenance, training
- Safety and public relations
- Cost capital and facilities
  - » no major facility changes
  - easily connects to existing system
- Retrofitting
- Operations impact
- Chemical shelf life
- Waste products

## 12 Process of Changing to MIOX

- MIOX site evaluation & installation
  - » site visit
  - » installation Winter '96
  - » 30 gpd water softener w/ 4,000 run, 220 outlets, 60 ft. of floor area
- SWSC evaluation of MIOX equipment
  - » phased approach. 30-day trial
  - 1/22/97 » phase one
  - dechlorination before comingling of influent and treated effluent
  - 2/26/97
  - run as normal with CI<sub>2</sub> cylinders on hand

P.04

## 13 MIOX StartupExperience

- Wrong data on chloride limit
- # High BOD's permit violation, anomalies
- Not initially flow-paced
- Tubing replaced
- Vendor provided low quality salt
- Filter clogging
- Bad power supplies from MIOX vendor
- m Undersizing needed another unit in wet weather

## 14 E Results of Changing to MIOX

- Safer, cheaper, easier & still met requirements
- Enhanced flexibility for other uses
  - » head of plant
  - » filamentary growth
  - » capacity for >20 lbs./day
- Provided required residual and performance
- Provided reduced safety costs and liability

## 15 Results of Changing to MIOX

- Extremely low infrastructure change costs
  - » piped directly into where chlorine was
  - » legal requirement to have sampling after chlorine contact chamber and before flow transmitter
  - » very easy to learn
  - a smooth switch; never without disinfectant
- Costs savings of \$10,000 per year for training, operations, maintenance
- MIOX meets all requirements of chlorine without any of the disadvantages

#### 16 🗿

## 17 What is MIOX Disinfection?

- Simple, safe, reliable operations
- Performance of chlorine dioxide
- Regulatory compliance
- Long-lived residual
- No waste products
- No shelf-life degradation
- m for the same or better cost

## 18 MIOX Systems

## 19 MIOX Technology

## 20 MIOX Technology

Individually, oxidants produced are powerful disinfectants that are in common use

- In combination, they are:
  - faster
  - more effective
  - Idll a widerrange of microbial contaminations

## 21 Mixed Oxidant Performance

- Mixed oxidants are many times more effective than chlorine products
- Mixed oxidants <u>kill a wider range</u> of microbial contaminants than chlorine
- Mixed oxidants kill them faster

## 22 Effectiveness

## 23 Simple, Cost-Effective Operations

- Simple Operations
  - No special training certification required
  - Self-diagnostic system
  - Consistent chemical produced; no adjusting flow rates
  - No additional maintenance or labor costs

## 24 Simple, Cost-Effective Operations

- Cost-Effective Operations
  - Capital and operations costs similar to on-site chlorine generators
  - Operations costs much lower than chlorine, ozone, chlorine dioxide
    - » no safety equipment or scrubbers
    - » reduced liability / insurance costs
    - » reduced labor
    - » replace cell and pump annually
    - » low power and chemical costs-only salt